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EXAMINER	
GREY, CHRISTOPHER P	
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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No. 09/963,487	Applicant(s) ROCHON ET AL.	
	Examiner Christopher P Grey	Art Unit 2667	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 September 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-58* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-58* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

1. Claim 46-49, 51, 52, 56 and 57 are rejected under 35 U.S.C. 102(a) as being anticipated by Lyon (CA 2292828)

Claim 46 Lyon discloses a method for traffic flow control, where information is obtained pertaining to the congestion level (bandwidth utilization level) of an output port (page 3 lines 14-page 4 line 2).

Lyon discloses a traffic flow controller (element 100 in fig 1) coupled to the input and output ports, where the traffic controller receives discard information from the output port, and formulates a traffic control message which is sent to the input port (page 2 lines 8-31 and see fig 1 and 2).

Claim 47 Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is exceeded for a particular queue, sending a flow control message for discarding (page 38 lines 9-17 and page 4 lines 3-13).

Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is not exceeded, forwarding the packets accordingly (page 38 lines 9-17 and page 4 lines 3-13).

Claim 48 Lyon discloses storing packets in an input queue, where a scheduler controls the flow of packets from the queues dependant upon received control flow messages, where the messages are formed as a result of the congestion level (page10 line 26-pagr 11 line18 and see page 10 lines 13-21).

Claim 49 Lyon discloses a discarder within the forwarder for sending packets on an alternate route for discard in the event that a flow control message indicates that packets are in condition for discard (page 10 lines 7-25).

Claim 51 Lyon discloses if a packet is in condition for discarding setting a specific bit to 1 (page 20 line 26- page 21 line 31).

Claim 52 Lyon discloses each output port determining a bandwidth priority of the cells that should be discarded, where marking the packets for discard is performed by setting a specific bit to 1 (page 21 line32- page 22 line19).

Claim 56 Lyon discloses a method for traffic flow control, where information is obtained pertaining to the congestion level (bandwidth utilization level) of an output port (page 3 lines 14-page 4 line 2).

Claim 57 Lyon discloses an output port connected to an output buffer, where the output buffer contains a number of output queues (element 30 in fig 3).

Lyon discloses an accumulator for maintaining a count of the level of congestion in an output port (page 3 line 14-page 4 line 2).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2, 25-37, 40-45 and 53-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lyon (CA 2292828) in view of Blumer et al. (US 2002/0105908)

<u>Claim 1, 37, 44</u> Lyon discloses a method for traffic flow control, where information is obtained pertaining to the congestion level (bandwidth utilization level) of an output port (page 3 lines 14-page 4 line 2), where each output port is associated with an output buffer (egress queue) as seen in fig 1 elements 16 a-n and elements 1-N.

Lyon discloses a traffic flow controller (element 100 in fig 1) coupled to the input and output ports, where the traffic controller receives discard information from the output port, and formulates a traffic control message which is sent to the input port (page 2 lines 8-31 and see fig 1 and 2).

Lyon also discloses sending priority information to the controller (Col 2 lines 26-31).

Lyon does not specifically disclose determining from the bandwidth utilization information, a discard probability associated with each egress queue.

Blumer et al. ('Blumer' hereinafter) discloses a determining mechanism connected to a buffer, for determining a drop probability for a buffer (paragraph 0013

and 0023), using a number of variables (bandwidth utilization information), including packet size and buffer fill (paragraph 0029).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the output buffers as disclosed by Lyon, to include the apparatus for determining a drop probability as disclosed by Blumer. The motivation for this modification is to manage buffer occupancy and use that information to control congestion within a switching device.

Claim 2 Lyon discloses a cell tap (traffic management entity) for monitoring and transmitting bandwidth priorities (bandwidth utilization information) about an output port (page 3 lines 7-13 and see element 26 in fig 3), where each output port is associated with an output buffer as can be seen in fig 1.

Claim 25 Lyon discloses a plurality of output ports (elements 1-N in fig 1). Lyon also discloses each o the plurality of output ports being connected to a respective one of the output buffers (see fig 1 elements 1-N and see fig 3).

Claim 26 Lyon discloses an output port connected to an output buffer, where the output buffer contains a number of output queues (element 30 in fig 3).

Claim 27 The rejection of claim 1 discloses providing discard probability information. Lyon discloses a controller with a processor with a program memory (elements 152 and 154 in fig 9), where a controller is implemented using software programs and variables stored in the memory (page 16 lines 13-21). It would have been obvious to one of the ordinary skill in the art at the time of the invention that any program could be implemented to provide the discard probability.

Claim 28 Lyon discloses a traffic flow controller (element 100 in fig 1) receiving discard information from the output port (page 2 lines 8-31 and see fig 1 and 2). Lyon also discloses the controller only sending flow control messages for discarding packets at the input ports when discarding is necessary (page 3 lines 14-page 4 line 2).

Lyon does not specifically disclose recording the discard probability associated with each egress queue at selected times, and detecting whether a change of at least a predetermined magnitude has occurred in the discard probability associated with the egress queue.

Blumer discloses an average buffer fill value being used to calculate the drop probability, where the average buffer fill value may be calculated on a periodic basis (paragraph 0033)

Blumer discloses comparing the calculated drop probability associated with a buffer to a number (predetermined magnitude) generated by a linear feedback shift register (paragraph 0028).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the controller and buffers as disclosed by Lyon, to receive and transmit respectively, drop probability information when a comparison to a random number has proven to be exceeded within the buffer as disclosed by Blumer. The motivation for this modification is to limit the amount of information being sent to the controller, thus limiting unnecessary congestion.

Claim 29 Lyon discloses a traffic flow controller (element 100 in fig 1) receiving discard information from the output port (page 2 lines 8-31 and see fig 1 and 2). Lyon

also discloses the controller only sending flow control messages for discarding packets at the input ports when discarding is necessary (page 3 lines 14-page 4 line 2).

Lyon does not specifically disclose recording the discard probability associated with each egress queue at selected times, and detecting whether a change of at least a predetermined magnitude has occurred in the discard probability associated with the egress queue. Lyon also does not disclose providing discard probability after a predetermined amount of time.

Blumer discloses an average buffer fill value being used to calculate the drop probability, where the average buffer fill value may be calculated on a periodic basis (paragraph 0033)

Blumer discloses comparing the calculated drop probability associated with a buffer to a number (predetermined magnitude) generated by a linear feedback shift register (paragraph 0028).

Blumer discloses a decision being made every 2 cycles (paragraph 0052), where a decision is based on whether the discard probability is greater than the number generated.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the controller and buffers as disclosed by Lyon, to receive and transmit respectively, drop probability information when a comparison to a random number has proven to be exceeded within the buffer as disclosed by Blumer. It would have also been obvious to one of the ordinary skill in the art at the time of the invention that the time taken for a decision to be made as disclosed by Blumer could be a

predetermined time, where 2 cycles could be the minimum amount of time before further processing. The motivation for this modification is to limit the amount of information being sent to the controller, thus limiting unnecessary congestion.

Claim 30 Lyon discloses a controller discarding or not discarding a packet associated with a particular output port depending on whether or not a threshold is exceeded (page 3 line 14- page 4 line 2).

Lyon does not specifically disclose determining an egress queue for which a packet is destined and transmitting or not transmitting based on the discard probability.

Blumer discloses determining to which queue a packet belongs by obtaining a packet identifier (paragraph 0052).

Blumer also discloses discarding the packets based on a drop probability (paragraph 0022 and 0013).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to use identifiers as disclosed by Blumer within the packets to distinguish between packets destined output ports, where a controller as disclosed by Lyon could be used to perform the distinguishing. The motivation for this modification is to identify packets destination.

Claim 31, 32, 54, 55 Lyon does not disclose generating a random number for the received packet; comparing the random number to the discard probability associated with the egress queue for which the received packet is destined, and transmitting or not transmitting based on the comparison.

Blumer discloses generating a random number, comparing a drop probability to the random number and discarding (claim 32) the packet if the drop probability is greater than the random number (paragraph 0026).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the output buffers as disclosed by Lyon, to include the apparatus for calculating comparing and discarding as disclosed by Blumer. The motivation for this modification is to achieve buffer management and avoid congestion.

<u>Claim 33</u> Lyon discloses if a packet is in condition for discarding setting a specific bit to 1 (page 20 line 26- page 21 line 9).

<u>Claim 34</u> Lyon discloses storing/queuing cells within an output buffer/queue (page4 lines 3-13).

Lyon discloses if a packet is in condition for discarding setting a specific bit to 1 (page 20 line 26- page 21 line 9).

Lyon discloses a discarder for discarding and otherwise, forwarding cells (page 2 lines 32-page 3 line 5).

<u>Claim 35</u> Lyon discloses an accumulator for determining a level of congestion in an output port, where each output port is coupled to an output buffer (page 3 line 14- page 4 line 2).

Lyon discloses an updating procedure, where a count of the congestion level of an output port is updated. Lyon also discloses if a threshold is not exceeded, not discarding the packets.

Lyon discloses setting a bit to 0 if a packet is not to be discarded (page 20 line 26- page 21 line 9).

It would have been obvious to one of the ordinary skill in the art at the time of the invention that the packet previously marked a discardable, could remain in an output queue for some time, and therefore be treated as a regular packet in the updating procedure seeing that the conditions above are met.

Claim 36 Lyon discloses the controller being implemented using a software program (page 16 lines13-21).

Claim 40 Lyon discloses a method for traffic flow control, where information is obtained on a switch fabric pertaining to the congestion level (bandwidth utilization level) of an output port (page 3 lines 14-page 4 line 2), where each output port is associated with an output buffer (egress queue) as seen in fig 1 elements 16 a-n and elements 1-N.

Lyon discloses a controller for determining discarding information (page 38 lines 9-17 and page 4 lines 3-13).

Lyon discloses a cell forwarder for receiving data destined for the output, and identifying the destination output port and queue (page 9 line 25- page 10 line 6).

Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is exceeded for a particular queue, sending a flow control message for discarding (page 38 lines 9-17 and page 4 lines 3-13).

Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is not exceeded, forwarding the packets accordingly (page 38 lines 9-17 and page 4 lines 3-13).

Lyon does not specifically disclose a drop probability evaluation module connected to the egress queues, said drop probability evaluation entity being adapted to determine a discard probability associated with each of the egress queues on the basis of the bandwidth utilization information.

Blumer et al. ('Blumer' hereinafter) discloses a determining mechanism connected to a buffer, for determining a drop probability for a buffer (paragraph 0013 and 0023), using a number of variables (bandwidth utilization information), including packet size and buffer fill (paragraph 0029).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the controller which is connected to both output and input ports as disclosed by Lyon, to perform the mechanism of calculating the drop probability in order to determine whether or not discarding of packets is necessary (abstract).

<u>Claim 41</u> Lyon discloses each output port is associated with an output buffer (egress queue) as seen in fig 1 elements 16 a-n and elements 1-N.

Lyon discloses a traffic flow controller which receives output port messages (page 7 line 35-page 8 line23), where it would have been obvious to one of the ordinary skill in the art at the time of the invention that the controller is connected to a plurality of output ports, where a plurality of ports may be divided into groups and connected to the controller via a line card within the controller, which transmits and receives data.

Lyon does not specifically disclose a portion of the drop probability evaluation module is provided one each of the output line cards.

Blumer et al. ('Blumer' hereinafter) discloses a determining mechanism connected to a buffer, for determining a drop probability for a buffer (paragraph 0013 and 0023).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the traffic flow controller as disclosed by Lyon, to calculate the drop probability as disclosed by Blumer, where line cards receive and transmit messages to output and input ports. The method for this modification is to ultimately determine whether or not discarding of packets is necessary (abstract).

<u>Claim 42</u> Lyon discloses a traffic flow controller connected to a plurality of input ports (fig 1), where it would have been obvious to one of the ordinary skill in the art at the time of the invention to implement a line card to enhance the connection.

Lyon discloses the forwarder being connected to the traffic flow controller for receiving input port messages (page 9 line 25- page 10 line 6).

<u>Claim 43</u> Lyon discloses a switch fabric (page 2 lines 5-25).

<u>Claim 45</u> Lyon discloses a cell forwarder for receiving data destined for the output, and identifying the destination output port and queue (page 9 line 25- page 10 line 6).

Lyon discloses the controller receiving and determining priorities (page 7 line 35- page 8 line 22).

Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is exceeded for a particular queue, sending a flow control message for discarding (page 38 lines 9-17 and page 4 lines 3-13).

Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is not exceeded, forwarding the packets accordingly (page 38 lines 9-17 and page 4 lines 3-13).

Claim 53 Lyon discloses information being obtained pertaining to the congestion level (bandwidth utilization level) of an output port (page 3 lines 14-page 4 line 2)

Lyon does not specifically discloses determining a discard probability.

Blumer et al. ('Blumer' hereinafter) discloses a determining mechanism connected to a buffer, for determining a drop probability for a buffer (paragraph 0013 and 0023), using a number of variables (bandwidth utilization information), including packet size and buffer fill (paragraph 0029).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the output buffers as disclosed by Lyon, to include the apparatus for determining a drop probability as disclosed by Blumer. The motivation for this modification is to manage buffer occupancy and use that information to control congestion within a switching device.

3. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lyon (CA 2292828) in view of Blumer et al. (US 2002/0105908) in further view of Cloonan (US 6898182)

<u>Claim 3</u> Lyon does not specifically disclose each packet being made up of a plurality of traffic bytes or a plurality of non-traffic bytes, and wherein obtaining bandwidth utilization information regarding packets received at the egress queues further includes determining for each particular one of the output ports, an average number of traffic bytes received per time unit for each egress queue connected to the particular output port.

Blumer discloses a mechanism for determining an average buffer fill, which is an average fill state of a buffer (page 2 paragraph 0022), and is calculated on a periodic basis (paragraph 0033).

Lyon does not specifically disclose each packet being made up of a plurality of traffic bytes or a plurality of non-traffic bytes.

Cloonan discloses each packet being assigned a priority, where the assigned priority depicts which packets are to be dropped, and furthermore, the priority is based on a customers level of service plan (Col 5 lines 30-40).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Lyon and Blumer, by ensuring that packets were sent with a priority, where priority (quality of service) determines the difference between a traffic byte or non-traffic byte. The motivation for the modification

is to further control the flow of packets in a data communications system (page 2 line 48-Col 3 line 2).

Claim 4 Lyon discloses information being obtained pertaining to the congestion level (allocated bandwidth) of an output port (page 3 lines 14-page 4 line 2); where each output port is associated with an output buffer (egress queue) as seen in fig 1 elements 16 a-n and elements 1-N.

Lyon discloses comparing the count (allocated traffic bandwidth) of each output queue to a bandwidth threshold (average received traffic bytes) for an output queue (page 38 lines 9-17 and page 3 lines 14-page 4 line 2).

Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is exceeded for a particular queue, sending a flow control message for discarding (page 38 lines 9-17 and page 4 lines 3-13).

Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is not exceeded, forwarding the packets accordingly

Lyon does not specifically disclose increasing or decreasing the discard probability. However, Blumer discloses determining a drop probability dependant on comparing an average buffer fill to a threshold (paragraph 0032).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the comparison of a count of the level of congestion in a particular queue to a threshold as disclosed by Lyon, with determining a drop probability based on a comparison procedure as disclosed by Blumer. The motivation for this combination is

to ensure buffer management through evaluating a buffer occupancy, and performing discarding of packets in the event of congestion. Furthermore, it would have been obvious to one of the ordinary skill in the art at the time of the invention that when the threshold is exceeded as disclosed by Lyon, that discarding increases the chances of discarding, and when the threshold is not exceeded, there is less of a chance of discarding.

4. Claims 5-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lyon (CA 2292828) in view of Blumer et al. (US 2002/0105908) in further view of Cloonan (US 6898182) in further view of Firoiu et al. (US 6820128)

Claim 5 Lyon discloses information being obtained pertaining to the congestion level (allocated bandwidth) of an output port (page 3 lines 14-page 4 line 2), where each output port is associated with an output buffer (egress queue) as seen in fig 1 elements 16 a-n and elements 1-N.

Lyon discloses comparing the count (allocated traffic bandwidth) of each output queue to a bandwidth threshold (average received traffic bytes) for an output queue (page 38 lines 9-17 and page 3 lines 14-page 4 line 2).

Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is exceeded for a particular queue, sending a flow control message for discarding (page 38 lines 9-17 and page 4 lines 3-13).

Lyon does not specifically disclose setting the discard probability to the sum of a time average of previous values of the discard probability and a positive increment or the sum of a time average of previous results of the discard probability and a negative increment.

Firoiu et al. ('Firoiu' hereinafter) discloses a drop function based on an average drop probability over an interval of time, where the drop probability is increased as a threshold is exceeded, and decreased as the queue size decreases in comparison to the threshold (Col 6 lines 32-67).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the comparison of a count of the level of congestion in a particular queue to a threshold as disclosed by Lyon, with increasing and decreasing an average drop probability based on the degree with which a threshold is exceeded as disclosed by Firoiu. The motivation for this combination is to ensure buffer management through evaluating a buffer occupancy, and performing discarding of packets in the event of congestion.

<u>Claim 6</u> Lyon discloses information being obtained pertaining to the congestion level (allocated bandwidth) of an output port (page 3 lines 14-page 4 line 2), where each output port is associated with an output buffer (egress queue) as seen in fig 1 elements 16 a-n and elements 1-N.

Lyon discloses comparing the count (allocated traffic bandwidth) of each output queue to a bandwidth threshold (average received traffic bytes) for an output queue (page 38 lines 9-17 and page 3 lines 14-page 4 line 2).

Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is exceeded for a particular queue, sending a flow control message for discarding (page 38 lines 9-17 and page 4 lines 3-13).

Lyon does not specifically disclose setting a temporary average number of received traffic bytes to the average number of received traffic bytes, setting a temporary discard probability equal to a time average of previous values of the discard probability for the particular egress queue, adding to the temporary discard probability a positive increment and adding to the average number of received traffic bytes a negative bandwidth increment, adding to the temporary discard probability a negative increment and adding to the average number of received traffic bytes a positive bandwidth increment, setting the discard probability for the particular egress queue to the temporary discard probability.

Blumer discloses determining an average buffer fill value being used to calculate the drop probability (paragraph 0033).

The combined teachings of Lyon and Blumer does not disclose setting a temporary discard probability equal to a time average of previous values of the discard probability for the particular egress queue, adding to the temporary discard probability a positive increment and adding to the average number of received traffic bytes a negative bandwidth increment, adding to the temporary discard probability a negative increment and adding to the average number of received traffic bytes a positive bandwidth increment, setting the discard probability for the particular egress queue to the temporary discard probability.

Firoiu et al. ('Firoiu' hereinafter) discloses a drop function based on an average drop probability over an interval of time, where the drop probability is increased as a threshold is exceeded, and decreased as the queue size decreases in comparison to the threshold (Col 6 lines 32-67).

Firoiu discloses dropping packets(decrementing bandwidth) if the average queue size exceeds a predefined number and adding packets (incrementing bandwidth) to a buffer in that the queue size is less than a predefined number (see fig 4 elements 402, 404, 408, 412 and 410).

Firoiu discloses determining an average drop probability and storing it for future use (Col 7 lines 45-67).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the comparison of a count of the level of congestion in a particular queue to a threshold as disclosed by Lyon, with increasing and decreasing an average drop probability based on the degree with which a threshold is exceeded as disclosed by Firoiu. The motivation for this combination is to ensure buffer management through evaluating a buffer occupancy, and performing discarding of packets in the event of congestion.

<u>Claim 7, 8, 9, 10, 11</u> The combined teachings of Lyon, Blumer and Cloonan do not teach performing (d), (e) and (f) a pre-determined number of times or until the temporary average number of received traffic bytes is within a desired range of the allocated traffic bandwidth for the particular egress queue or until the depth of the particular egress queue is within a desired range.

Firoiu discloses measuring the queue size against a minimum and maximum value of queue size, where the discard probability is increased as the queue size increases pass a minimum value of queue size, and decreased as the queue size decreases from a maximum queue size.

Foroiu discloses increasing and the drop probability, where packets from a particular queue are dropped or added accordingly, until it is determined that the queue size ranges from a zero to a minimum value (Col 6 lines 32-52), where it would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the measured queue sizes to tabulate the variability in queue size.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Lyon, Blumer and Cloonan, with measuring and determining a queue size with respect to a minimum and maximum value. The motivation for this modification is to further enhance buffer management with regards to bufer occupancy.

<u>Claim 12</u> The combined teachings of Lyon, Blumer and Cloonan do not teach determining an average number of traffic bytes that would be received at the particular egress queue of the discard probability for the particular egress queue were zero; if the average number of traffic bytes that would be received at the particular egress queue if the desired discard probability for the particular egress queue were zero is greater than the allocated traffic bandwidth for the particular queue, adding a positive increment to the allocated traffic bandwidth for the particular egress queue; if the average number of traffic bytes that would be received at the particular egress queue if the desired discard

probability for the particular egress queue were zero is less than the allocated traffic bandwidth for the particular queue, adding a negative increment to the allocated traffic bandwidth for the particular egress queue.

Firoiu discloses a zero probability for a queue size ranging from zero to a minimum value.

Firoiu discloses increasing the queue size when the discard probability is within the range of zero to a minimum value.

Firoui discloses increasing the drop probability, which in turn drops packets to decrease bandwidth, when a minimum value is exceeded (Col 6 lines 32-52).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Lyon, Blumer and Cloonan, with measuring and determining a queue size with respect to a minimum and maximum value. The motivation for this modification is to further enhance buffer management with regards to buffer occupancy.

<u>Claim 13</u> Lyon discloses a method for traffic flow control, where information is obtained pertaining to the congestion level (bandwidth utilization level) of an output port (page 3 lines 14-page 4 line 2), where each output port is associated with an output buffer (egress queue) as seen in fig 1 elements 16 a-n and elements 1-N.

Lyon discloses an accumulator for maintaining a count for each output port, where each output port corresponds to a number of queues (all egress queues) as can be seen in fig 3.

Lyon does not disclose the step of adding a positive increment to the allocated traffic bandwidth for the particular egress queue is executed only if the total bandwidth allocated for all egress queues connected to the particular output port is less than the available traffic bandwidth for all egress queues connected to the particular output port.

Firoui discloses decreasing the drop probability as a queue size becomes less than a maximum value, where decreasing the drop probability results in increasing the bandwidth (increment) as disclosed in Col 6 lines 32-52.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the accumulator capable of maintaining a count for each output port, with increasing the allocated bandwidth as disclosed by Firoui in the event that the count for each output port (total queues) is less than a maximum value. The motivation for this combination is to provide buffer management and regulate buffer occupancy.

<u>Claim 14</u> The combined teachings of Lyon, Blumer and Cloonan do not teach determining a bandwidth gradient that is indicative of a rate at which the available traffic bandwidth for all egress queues connected to the particular output port is to be increased or decreased; increasing or decreasing the available traffic bandwidth for all egress queues connected to the particular output port as a function of the bandwidth gradient.

Firoiu discloses a graph depicting the drop probability vs. the queue size (figs 3 a and b) where the drop probability increases or decreases at a rate as a function of these graphs (Col 6 lines 32-52), where it would have been obvious to one of the ordinary skill

in the art at the time of the invention that increasing or decreasing the drop probability directly affects the bandwidth as disclosed in the rejection of claim 13.

The motivation is the same as that for claim 13.

<u>Claim 15</u> Lyon discloses an accumulator for maintaining a count for each output port, where each output port corresponds to a number of queues (all egress queues) as can be seen in fig 3.

Lyon discloses information being obtained pertaining to the congestion level (allocated bandwidth) of an output port (page 3 lines 14-page 4 line 2), where each output port is associated with an output buffer (egress queue) as seen in fig 1 elements 16 a-n and elements 1-N.

Lyon does not disclose determining, for each particular one of the at least one output port, an average number of non-traffic bytes received per time unit from the particular output port, and wherein determining an available traffic bandwidth for all egress queues connected to the particular output port further includes: setting a maximum available traffic bandwidth to the difference between said total link capacity and said average number of non-traffic bytes; wherein the available traffic bandwidth for all egress queues connected to the particular output port is bounded above by the maximum available traffic bandwidth.

Blumer discloses a mechanism for determining an average buffer fill, which is an average fill state of a buffer (page 2 paragraph 0022), and is calculated on a periodic basis (paragraph 0033).

The combined teachings of Lyon and Blumer does not disclose non traffic bytes and wherein determining an available traffic bandwidth or all egress queues connected to the particular output port further includes: setting a maximum available traffic bandwidth to the difference between said total link capacity and said average number of non-traffic bytes; wherein the available traffic bandwidth for all egress queues connected to the particular output port is bounded above by the maximum available traffic bandwidth.

Cloonan discloses each packet being assigned a priority, where the assigned priority depicts which packets are to be dropped, and furthermore, the priority is based on a customers level of service plan (Col 5 lines 30-40), where non traffic bytes are those assigned with the lower priorities.

The combined teachings of Lyon, Blumer and Cloonan do not teach setting a maximum available traffic bandwidth to the difference between said total link capacity and said average number of non-traffic bytes; wherein the available traffic bandwidth for all egress queues connected to the particular output port is bounded above by the maximum available traffic bandwidth.

Firoui discloses determining a maximum queue size (Col 6 lines32-52), where it would have been obvious to one of the ordinary skill in the art at the time of the invention to modify determining the maximum size with a priority factor as disclosed by Cloonan, where the maximum value is a result of the maximum available capacity less the average number of lower priority traffic bytes. The motivation for this modification is to ensure that priority packets are transmitted effectively.

Claim 16 The combined teachings of Lyon and Cloonan do not teach determining the average number of traffic bytes that would be received at the particular egress queue if the discard probability for the particular egress queue were zero includes evaluating a function of the average number of traffic bytes received per time unit for the particular egress queue and the time average of previous values of the discard probability for the particular egress queue.

Blumer discloses calculating an average buffer fill, and uses an equation relating the drop probability to the average buffer fill (paragraph 0041 and 0042).

The combined teachings of Lyon, Blumer and Cloonan do not teach if the discard probability for the particular egress queue were zero includes evaluating a function of the average number of traffic bytes received per time unit for the particular egress queue and the time average of previous values of the discard probability for the particular egress queue.

Firoiu discloses the drop probability being zero (Col 6 lines 32-67).

Firoiu et al. ('Firoiu' hereinafter) discloses a drop function based on an average drop probability over an interval of time, where the drop probability is increased as a threshold is exceeded, and decreased as the queue size decreases in comparison to the threshold (Col 6 lines 32-67), where it would have been obvious to one of the ordinary skill in the art at the time of the invention that determining the drop probability over an interval of time could extend to determining an average drop probability based on previous values, which would be included within that interval of time.

Claim 17 The combined teachings of Lyon and Cloonan do not teach the function being the quotient between the average number of traffic bytes received pet time unit for the particular egress queue and the difference between unity and the time average of previous values of the discard probability for the particular egress queue.

Blumer discloses an equation relating the average buffer fill to the drop probability and unity, where it would have been obvious to one of the ordinary skill in the art at the time of the invention that rearranging parts of an equation involves only routine skill in the art.

5. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lyon (CA 2292828) in view of Blumer et al. (US 2002/0105908) in further view of Cloonan (US 6898182) in further view of Derby et al. (US 5359593)

Claim 18, 19 The combined teachings of Lyon and Cloonan do not teach determining the average number of traffic bytes that would be received at the particular egress queue if the discard probability for the particular egress queue were zero; and the positive or negative increment being a fraction of the average number of traffic bytes that would be received at the particular egress queue if the discard probability were zero.

Blumer discloses an average buffer fill value being used to calculate the drop probability, where the average buffer fill value may be calculated on a periodic basis (paragraph 0033).

The combined teachings of Lyon, Blumer and Cloonan do not teach determining the average number of traffic bytes if the discard probability for the particular egress queue were zero; and the positive or negative increment being a fraction of the average number of traffic bytes that would be received at the particular egress queue if the discard probability were zero.

Firoiu discloses the drop probability being zero (Col 6 lines 32-67).

Firoiu discloses measuring the queue size against a minimum and maximum value of queue size, where the discard probability is increased as the queue size increases pass a minimum value of queue size, and decreased as the queue size decreases from a maximum queue size.

The combined teachings of Lyon, Blumer, Cloonan and Firoiu does not disclose the positive or negative increment being a fraction of the average number of traffic bytes that would be received at the particular egress queue if the discard probability were zero.

Derby discloses increasing or decreasing bandwidth (Col 11 lines 28-60) where a hysterisis parameter is used to gradually increase or decrease the bandwidth (Col 16 lines 50-67), where it would have been obvious to one of the ordinary skill in the art at the time of the invention that increasing or decreasing the bandwidth would involve incrementing or decrementing by a particular value, where that value could be any fraction of the average number of traffic bytes.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Lyon, Blumer, Cloonan and Firoiu to

implement the hysterisis function as disclosed by Derby. The motivation for this modification is to more effectively increase and decrease the bandwidth.

6. Claims 20-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lyon (CA 2292828) in view of Blumer et al. (US 2002/0105908) in further view of Cloonan (US 6898182) in further view of Laboy et al. (US 6442652)

Claim 20 Lyon discloses each output port is associated with an output buffer (egress queue) as seen in fig 1 elements 16 a-n and elements 1-N.

The combined teachings of Lyon, Blumer, Cloonan and Firoiu do not specifically disclose determining for each particular one of the at least one output port, an average idle time between successive packets received from the particular output port.

Laboy discloses implementing an idle time monitor dedicated to monitoring an average idle time (Col 4 lines 29-55).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Lyon, Blumer, Cloonan and Firoiu to monitor the average idle time as disclosed by Laboy, at the output ports. The motivation for this modification is to monitor idle stages of transmission in order to make adjustments to improve the transmission of packets.

Claim 21, 22,23 The combined teachings of Lyon, Blumer and Cloonan do not specifically disclose comparing the average idle time from the particular output port to a threshold; and if the average idle time is below the threshold, setting the bandwidth

gradient to indicate a first rate of decrease in the available traffic bandwidth for all egress queues connected to the particular output port.

Firoiu et al. ('Firoiu' hereinafter) discloses a drop function based on an average drop probability over an interval of time, where the drop probability is increased as a threshold is exceeded, and decreased as the queue size decreases in comparison to the threshold (Col 6 lines 32-67).

Firoiu discloses dropping packets(decrementing bandwidth) if the average queue size exceeds a predefined number and adding packets (incrementing bandwidth) to a buffer in that the queue size is less than a predefined number (see fig 4 elements 402, 404, 408, 412 and 410).

The combined teachings of Lyon, Blumer, Firoiu and Cloonan do not specifically disclose comparing the average idle time from the particular output port to a first threshold

Laboy discloses comparing the monitored average idle time to a threshold where a decision is made based on whether or not that threshold is exceeded.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Lyon, Blumer, Firoiu and Cloonan to monitor the idle time and compare that value to a threshold as disclosed by Laboy, in order to make the necessary adjustments to the bandwidth as disclosed by Firoiu. The motivation for this modification is to use idle time in order to adjust the bandwidth of a given queue.

<u>Claim 24</u> Lyon discloses a method for traffic flow control, where information is obtained pertaining to the congestion level (degree of memory utilization) of an output port (page 3 lines 14-page 4 line 2), where each output port is associated with an output buffer (egress queue) as seen in fig 1 elements 16 a-n and elements 1-N.

The combined teachings of Lyon, Blumer, Firoiu and Cloonan does not teach programming at least one of the first, second and third thresholds as a function of the degree of memory utilization.

Laboy discloses when average idle time is below a threshold, there being a heavy load, where it would have been obvious to one of the ordinary skill in the art at the time the invention that determining the threshold is based on a load size (Col 4 lines35-Col 5 line3).

The motivation is the same as that for claim 23.

7. Claims 38 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lyon (CA 2292828) in view of Firoiu et al. (US 6820128)

Claim 38 Lyon discloses a method for traffic flow control, where information is obtained pertaining to the congestion level (bandwidth utilization level) of an output port (page 3 lines 14-page 4 line 2), where each output port is associated with an output buffer (egress queue) as seen in fig 1 elements 16 a-n and elements 1-N.

Lyon discloses a controller for comparing the count (allocated traffic bandwidth), received from an accumulator, of each output queue to a bandwidth threshold (average received traffic bytes) for an output queue (page 38 lines 9-17 and page 3 lines 14-page 4 line 2).

Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is exceeded for a particular queue, sending a flow control message for discarding (page 38 lines 9-17 and page 4 lines 3-13).

Lyon discloses determining discarding information dependant on the results of the comparison, and if the threshold is not exceeded, forwarding the packets accordingly

Lyon does not disclose the probability processing entity being operable to; set the discard probability for the particular egress queue to the sum of a time average of the previous values of the discard probability for the particular egress queue and either a positive or a negative increment, depending on whether the average number of received traffic bytes for the particular egress queue is greater or less than the allocated traffic bandwidth for the particular egress queue.

Firoiu et al. ('Firoiu' hereinafter) discloses a drop function based on an average drop probability over an interval of time, where the drop probability is increased as a threshold is exceeded, and decreased as the queue size decreases in comparison to the threshold (Col 6 lines 32-67).

Firoiu discloses dropping packets(decrementing bandwidth) if the average queue size exceeds a predefined number and adding packets (incrementing bandwidth) to a buffer in that the queue size is less than a predefined number (see fig 4 elements 402, 404, 408, 412 and 410).

Firoiu discloses determining an average drop probability and storing it for future use (Col 7 lines 45-67).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the comparison of a count of the level of congestion in a particular queue to a threshold as disclosed by Lyon, with increasing and decreasing an average drop probability based on the degree with which a threshold is exceeded as disclosed by Firoiu. The motivation for this combination is to ensure buffer management through evaluating a buffer occupancy, and performing discarding of packets in the event of congestion.

Claim 39 Lyon discloses the controller being implemented using a software program (page 16 lines13-21).

(abstract).

8. Claims 50 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lyon (CA 2292828) in view of Haskin et al. (US 6813242)

<u>Claim 50</u> Lyon does not specifically disclose not transmitting the received packet packet to the ingress entity includes rerouting the packet along the alternate route.

Haskin discloses rerouting the packet along the alternate route from an ingress to an egress in the event of congestion (Col 2 lines 28-50).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the method of rerouting a packet from an ingress to an egress as disclosed by Haskin in the event of congestion as indicated by a flow control message as disclosed by Lyon. The motivation for this combination is to avoid congestion.

9. Claims 58 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lyon (CA 2292828) in view ofJefferies et al. (US 6728253)

<u>Claim 58</u> Lyon discloses an output port connected to an output buffer, where the output buffer contains a number of output queues (element 30 in fig 3).

Lyon does not specifically disclose the congestion information including variability in the occupancy of each of the egress queues.

Jefferies discloses determining a variable occupancy value of each a plurality of queues (Col 2 lines 25-44), and furthermore using this information to allocate data bandwidth from a source.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to implement the scheduler as disclosed by Jefferies, within the controller as disclosed by Lyon. The motivation for this modification is to allow the flow control messages as disclosed by Lyon to adjust a bandwidth given that the queue occupancy has been evaluated, and it has been determined that a certain level of congestion has bee reached.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher P Grey whose telephone number is (571)272-3160. The examiner can normally be reached on 6:30-3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chi Pham can be reached on (571)272-3179. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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